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# Distribution of the montane spruce forest on peat *Bazzanio-Piceetum* in the Beskid Mały Mts., its threats and protection

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**Abstract:** Studies on the distribution and differentiation of *Bazzanio-Piceetum* in the Beskid Mały Mts. started in 2003. Patches of the association were found in the managed State Forests of the Sucha and Jeleśnia Forest Inspectorates, as well as in private forests near Targoszów, Krzeszów and Tresna. Such a localisation is influenced by serious threats caused by forest management: deforestation of slopes, forest roads or trails which cross patches of vegetation and by wood transport along stream beds. These activities disturb the hydrological relationships in the area and become the cause of elimination of many hygrophilous species. Two subassociations: *Bazzanio-Piceetum equisetetosum sylvaticae* and *B.-P. typicum* were distinguished up to now, upon the analysis of phytosociological materials. The fitness of the phytocoenoses is evidenced by the abundance of many peat-moss and rare liverwort species, *Bazzania trilobata* among others, which are well-known indicators of changes in the natural environment. All patches of *Bazzanio-Piceetum* in the Beskid Mały Mts. are unique, both because of the role played by bryophytes in their phytocoenoses, and the combination of specific habitat conditions essential for their development. Their protection is an urgent need.

**Key words:** *Bazzania trilobata*, *Bazzanio-Piceetum*, Beskid Mały, bryophytes, nature protection, Polish Western Carpathians

## 1. Introduction

The montane spruce forest on peat *Bazzanio-Piceetum* Br.-Bl. et Siss. 1939 in Br.-Bl. *et al.* 1939 (Seibert 1992) is identified in Europe with the unit described under the primary name *Mastigobryeto-Piceetum* (Schmid et Gaisberg 1936) Br.-Bl. et. Siss. 1939, which is well-documented, especially from Schwarzwald, Germany (Braun-Blanquet *et al.* 1939; Bartsch & Bartsch 1940; Oberdorfer 1957; Pott 1995). It also occurs in Slovakia, Bohemia, Austria and Switzerland (Tüxen *et al.* 1983). However, it is acknowledged as a critical and rarely documented association in Poland (Matuszkiewicz 2001). Until now, only single localities have been reported from Babia Góra National Park (Bujakiewicz 1981; Kasprowicz 1996) and from the Silesian Beskid Mts. (Parusel 2001; Wilczek 2006). The occurrence of *Bazzanio-Piceetum* in the Beskid Mały Mts. was ascertained by the authors in 2003. Therefore, this is a newly identified region with confirmed localities of the association in Poland (Brzustewicz *et al.* 2004).

## 2. Material and methods

Phytosociological studies have been conducted since the autumn of 2003, when patches of *Bazzanio-Piceetum* were found near Targoszów. Afterwards, phytosociological relevés were made following the Braun-Blanquet method. The characteristic combination of species from the herb and bryophyte layers determined which patches of the association were selected for the further studies. Patches with *Pinus sylvestris* as the dominant species in the tree stands, which are relatively common in private forests in the area of Targoszów, Krzeszów and Tresna near Żywiec, were not eliminated (Brzustewicz & Barć 2006).

Vascular plant names follow Mirek *et al.* (2002), mosses – Ochrya *et al.* (1992), and liverworts – Grolle & Long (2000).

In the paper, the actual distribution of the association in the Beskid Mały Mts. is presented in an ATPOL square grid (Zając 1978) using the map base according to Kotońska (1991, changed). An attempt at threat identification

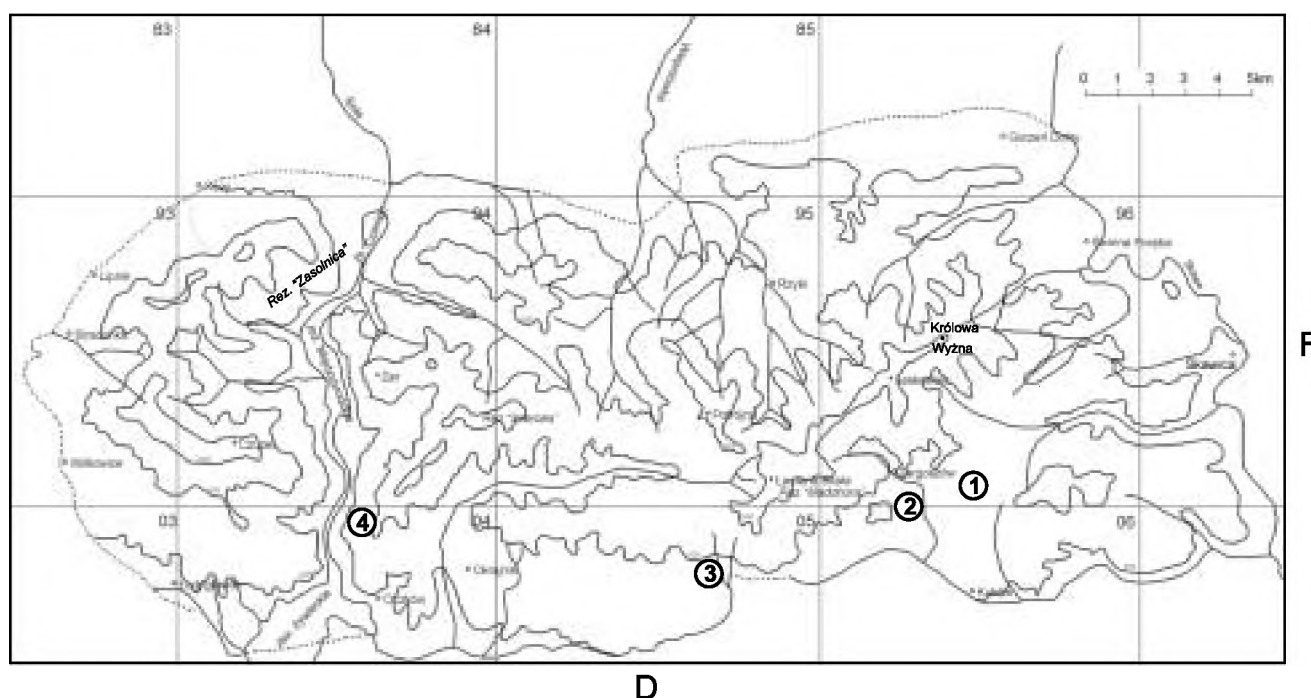
is undertaken. Moreover, a method and a proposal for its protection are briefly considered.

### 3. Results and discussion

Patches of *Bazzanio-Piceetum* were found in the Beskid Mały State Forests of the Sucha Forest Inspectorate, the Targoszów Forestry, and of the Jeleśnia Forest Inspectorate, the Ślemień Forestry, as well as in private forests in the area of Targoszów, Krzeszów and Tresna near Żywiec (Fig. 1).

to the presence of Ciężkowice sandstone formations, as well as coarse or pebble conglomerates in the Istebna sandstone layers.

Two subassociations were temporarily distinguished in the Beskid Mały Mts. after an analysis of phytosociological relevés: *Bazzanio-Piceetum equisetetosum sylvaticae* (comp. Kasprowicz 1996 *nom. inval.*) and *B.-P. typicum* (comp. Parusel 2001; Wilczek 2006). In both units, the tree stand *Picea abies* prevails, which in many patches competes with *Pinus sylvestris*. The last species dominates in some localities and creates an



**Fig. 1.** Distribution of *Bazzanio-Piceetum* patches in the Góry Zasolskie Mts. in ATPOL grid (Zajac 1978)  
 Explanations: locality number 1 – Krzeszów; 2 – Targoszów; 3 – Ślemień; 4 – Tresna

The occurrence of *Bazzanio-Piceetum* is, in general, connected with specific pedological and mesoclimatic conditions. The association occupies wet and cold regions of mountain areas, at insignificantly inclined terrains without outflow or at the base of slopes, where it prefers rarely occurring peat soils which are often gleyed (Michalko *et al.* 1987). The majority of these demands are fulfilled in the eastern part of the Beskid Mały Mts. – the Góry Zasolskie Mts. The hydrological network, which at the base of the range has an atypical, latitudinal course, allows for a slow water flow of tributaries from a watershed between the Soła and the Skawa rivers. All these factors, as well as an impenetrable geological formation, create favourable conditions for the development of local marshes and *Bazzanio-Piceetum* patches. Moreover, the analysis of geological maps (Książkiewicz 1930) leads to the hypothesis that the range of the association in the Beskid Mały Mts. is related

anthropogenic form of the association. The herb layer is composed of a typical (for spruce forests), light-tolerant species of wet areas, and those adapted to heavy, badly aerated and acid soils, like *Equisetum sylvaticum* (comp. Michalko *et al.* 1987). However, some protected vascular plants occur e.g.: *Blechnum spicant*, *Epipactis palustris*, *Lycopodium annotinum*, *L. clavatum*. Moreover, many bryophyte and liverwort species, in particular: *Sphagnum girgensohnii*, *Leucobryum glaucum* and *Bazzania trilobata* reach relatively high covers (Table 1).

The localisation of *Bazzanio-Piceetum* patches at the base of slopes and nearby local roads is the cause of serious threats from forest management and tourism. Forestry has been acknowledged as one of the main anthropogenic factors influencing the resources of vascular plants and causing them to be threatened (Kujawa-Pawlaczyk & Pawlaczyk 2003). The same refers to the

recession of bryophytes in mountain areas (Klama 2003; Stebel 1998, 2003). Deforestation of slopes, forest road building and wood transport along stream beds cause disturbances in the hydrological relationships of the area. These become the main reasons why hygrophilous plants are eliminated. The visual attractiveness or utility of certain bryophyte species make them vulnerable to destruction by collectors or use in gardening.

It has been ascertained that an anthropogenic secondary community with *Pinus sylvestris* in the tree stand is a permanent refuge for the diagnostic species

of 9.07.2004, Minister of the Environment Regulation of 16.05.2005 – all are legal implements strengthening the arguments for protection of the best maintained localities of the association in the reserve rank.

#### 4. Conclusions

- The distribution of *Bazzanio-Piceetum* in the Beskid Mały Mts. is unique and depends on climatic and habitat conditions. The appropriate combination of conditions occurs in the Góry Zasolskie Mts.

**Table 1.** Shortened synthetic comparison of participation of the diagnostic species for *Bazzanio-Piceetum* Br.-Bl. et Siss. 1939 in Br.-Bl. et al. 1939 in physical-geographic units of the Western Carpathians

Physical-geographic unit	Beskid Wysoki Mts.		Beskid Śląski Mts.		Beskid Mały Mts.
Phytosociological subunits	<i>B.-P.</i> <i>caricetosum</i> <i>nigrae</i>	<i>B.-P.</i> <i>equisetetosum</i> <i>sylvaticae</i>	<i>B.-P.</i> in total	<i>B.-P.</i> in total	<i>B.-P.</i> in total
	1		2	3	4
*Ch. + D. <i>Bazzanio-Piceetum</i>					
* <i>Bazzania trilobata</i>	V <sup>1013</sup>	II <sup>143</sup>	V <sup>194</sup>	IV <sup>383</sup>	V <sup>536</sup>
* <i>Sphagnum girgensohnii</i>	V <sup>5625</sup>	V <sup>4721</sup>	V <sup>2811</sup>	V <sup>3202</sup>	V <sup>1877</sup>
<i>Polytrichum commune</i>	V <sup>3938</sup>	IV <sup>1071</sup>	II <sup>200</sup>	III <sup>1296</sup>	III <sup>1350</sup>
D. of lower units					
<i>Carex nigra</i>	V <sup>163</sup>	I <sup>7</sup>	I <sup>1</sup>	I <sup>79</sup>	I <sup>1</sup>
<i>Equisetum sylvaticum</i>	II <sup>19</sup>	V <sup>4607</sup>	IV <sup>1511</sup>	IV <sup>950</sup>	II <sup>64</sup>

Explanations: 1 – Kasproicz (1996); 2 – Parusel (2001) – *B.-P. caricetosum nigrae*, *B.-P. equisetetosum sylvaticae* and *B.-P.* variant with *Calamagrostis villosa*; 3 – Wilczek (2006) – *B.-P. caricetosum nigrae*, *B.-P. equisetetosum sylvaticae*, *B.-P. typicum*; 4 – Brzustewicz & Barć (2006) – temporary *B.-P. equisetetosum sylvaticae*, *B.-P. typicum*

of the association. Nevertheless, the management activities, connected with cutting out the tree stand, change the habitat conditions and lead to transformations in the species composition of all phytocoenoses, including the specific bryophyte layer.

Effective protection of *Bazzanio-Piceetum* phytocoenoses has become an absolute necessity because of the dominant role played by protected liverwort, moss and peat-moss species in patches of this association, as well as because of the rarity of the specific combination of habitat conditions in which the association develops in the Beskid Mały Mts. The Nature Protection Act of 16.04.2004, Minister of the Environment Regulation

- The association is endangered by intensive forest management (which disturbs the hydrological regime), by tourism and illegal collection of plant material.
- Patches of *Bazzanio-Piceetum* are a refuge for rare and protected vascular, liverwort, moss and peat-moss species.
- Legal solutions introduced in 2004 and 2005 allow for the effective protection of the best maintained patches of *Bazzanio-Piceetum* as a nature reserve.

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